Memo

Date:	Thursday, January 08, 2015
Project:	Upper Columbia River (UCR)
To:	Kris McCaig, Teck American Incorporated (TAI)
From:	TAI Technical Team
Subject:	Proposed Modifications to Batching for UCR Long-Term Bioassay Samples

In an email dated December 31, 2014, the U.S. Environmental Protection Agency (EPA) technical team proposed to modify the batching of UCR long-term bioassay samples. In particular, the EPA team proposed to move Sample SE-3-R8 from Batch 2 to Batch 3 and also move Sample SE-2-R1 from Batch 3 to Batch 2. Our understanding is that this EPA proposal was largely based on mean Probable Effects Concentration Quotient based on 8 metals (mPECQ8) values associated with samples.[1] Although differences in bioassay sample batching proposed by the TAI and EPA teams are generally small, the TAI team believes that, when other factors are considered, the batches should be further adjusted for two additional samples. Specifically, in addition to modifications proposed by EPA, the TAI team proposes that the bioassay batches be further modified to move Sample SE-G-2 from Batch 2 to Batch 3 and move Sample SE-LAL-2 from Batch 3 to Batch 2.

From the outset of Phase 2 sediment study design, and as driven by EPA's Level of Effort document, samples were to be divided into high, medium/intermediate, and low bins. The threshold for high bin mPECQ was defined to be a value of 2. The concept behind binning was that samples within the same bin would be given the same weight when being assigned into batches for bioassay analysis. By focusing on the scale of mPECQ values rather than the bin, EPA's modification impacts other aspects of the proposed batching because Samples SE-3-R8 and SE-2-R1 have different characteristics that go beyond mPECQ8 or Zinc to Vanadium ratio (Zn/V) and include a nearly 6-fold difference in total organic carbon (TOC), a nearly 3-fold difference in excess Simultaneously Extractable Metals (xSEM), and differences in other properties. Such differences in xSEM and TOC are expected to be important because those attributes tend to be more directly related to the potential bioavailability of metals than mPECQ8 or Zn/V.

Recognizing that it may not be possible to fully balance all sediment properties across bioassay batches, the TAI team proposes to move Sample SE-G-2 from Batch 2 to Batch 3 and also move Sample SE-LAL-2 from Batch 3 to Batch 2. In addition to modifications for SE-3-R8 and SE-2-R1 proposed by EPA, the modifications for SE-G-2 and SE-LAL-2 attempt adjust the distributions and ranges of xSEM and TOC within and across batches. See Figures 1-3.

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[1] There is a strong correlation between mPECQ and the Zinc to Vanadium ratio (Zn/V). However, both mPECQ and Zn/V are related to total metal concentrations rather than bioavailable metal.
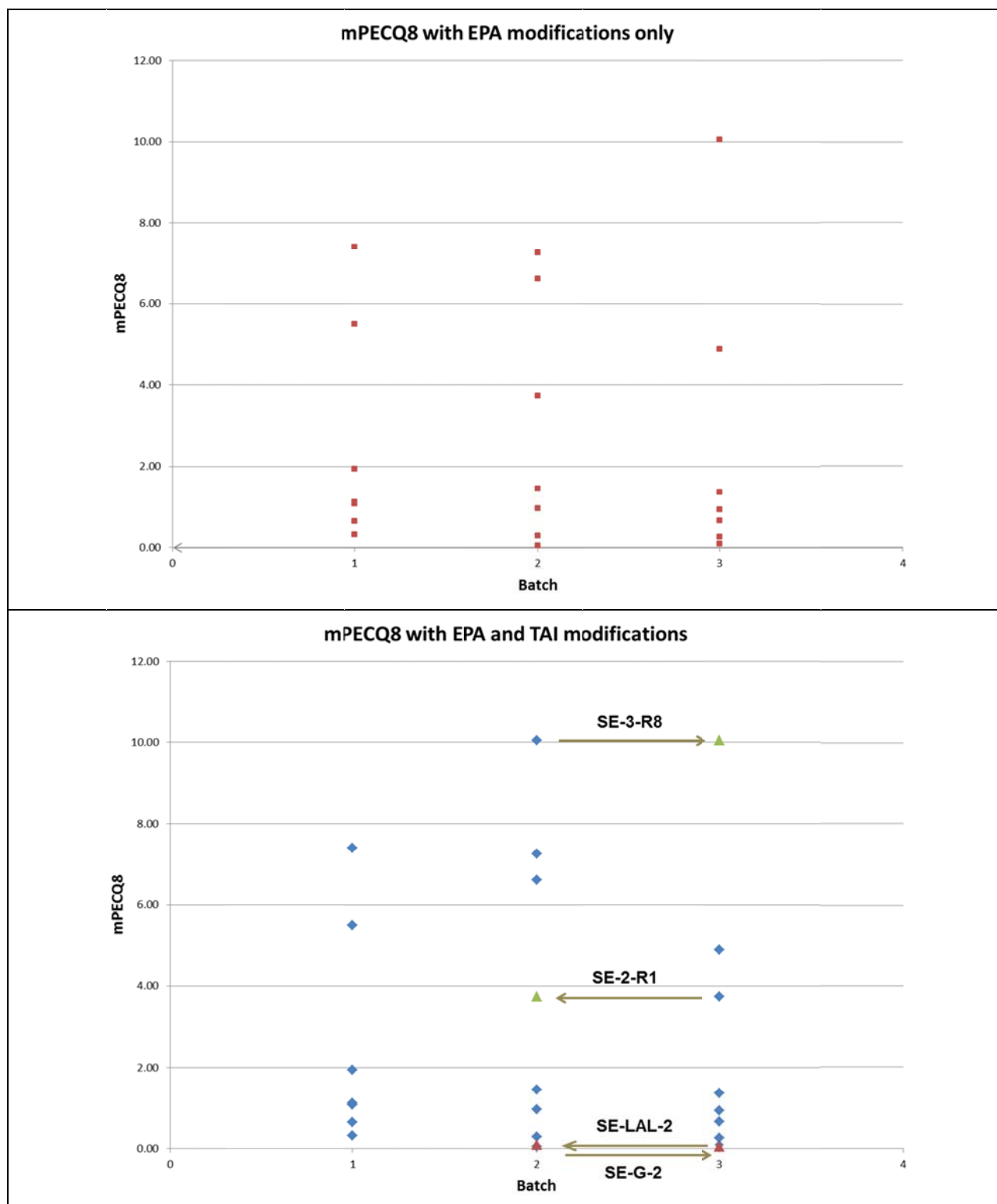
Figure 1. Proposed UCR long-term bioassay sample batching modifications considering mPECQ8.
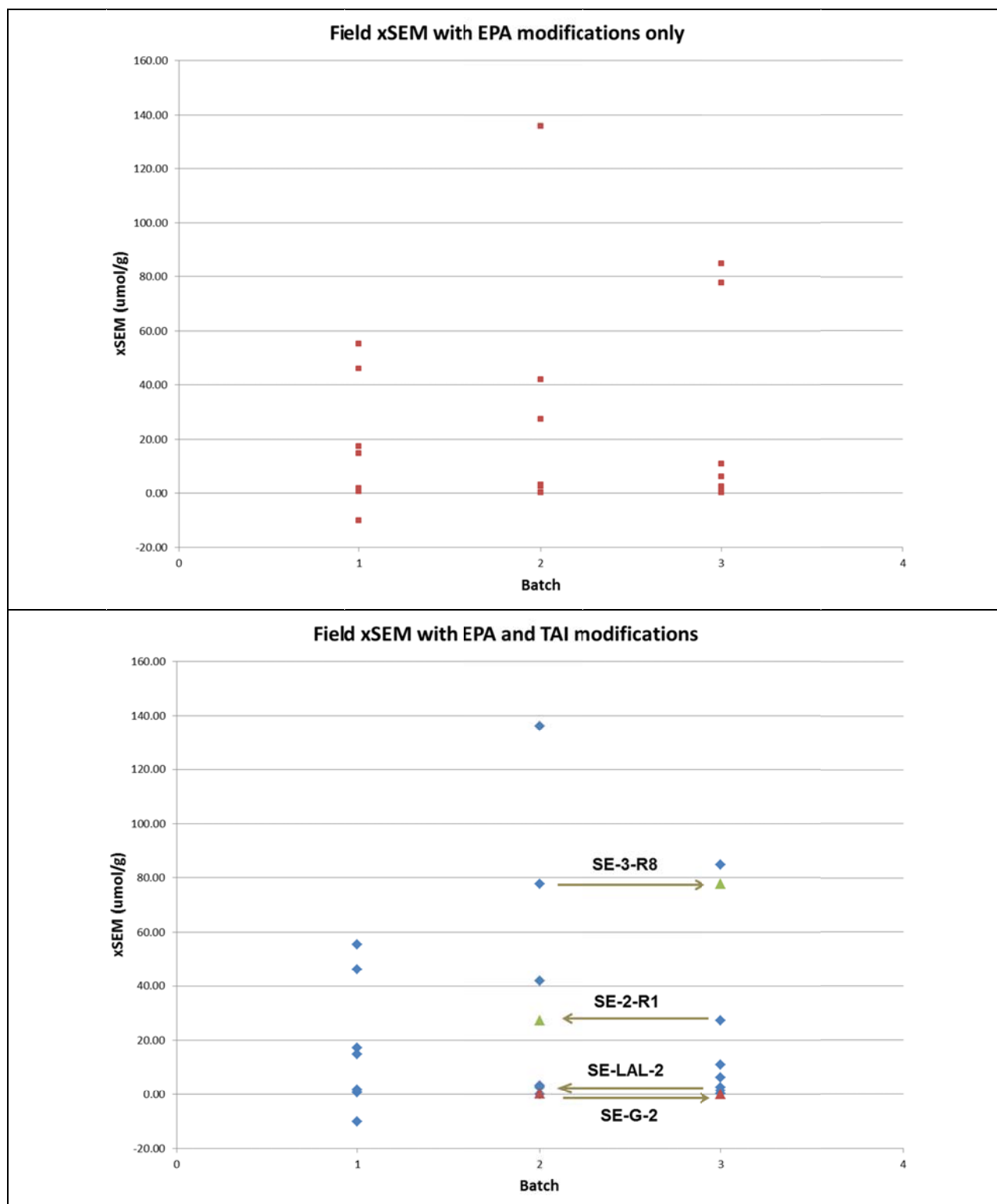
Figure 2. Proposed UCR long-term bioassay sample batching modifications considering xSEM.
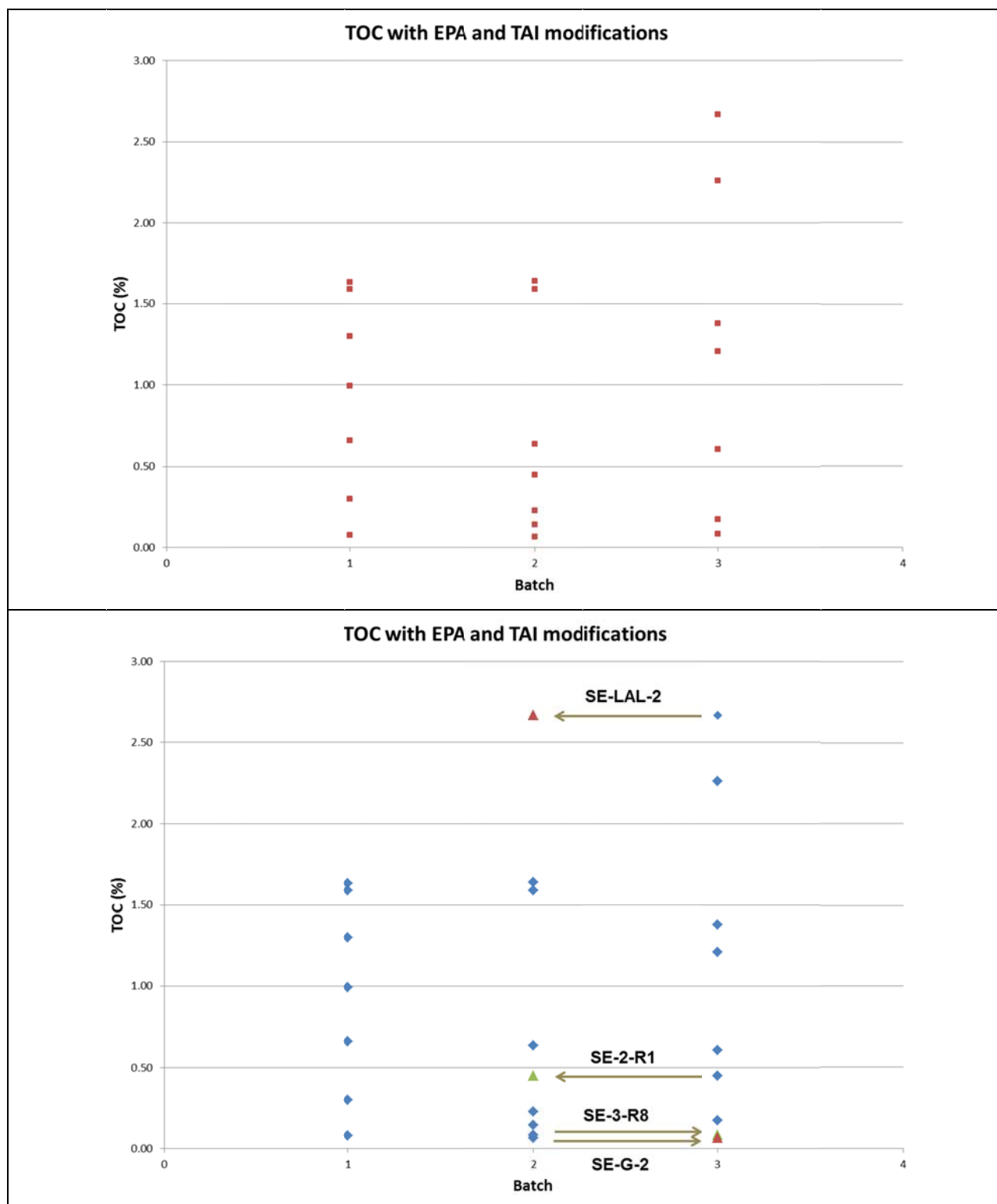
Figure 3. Proposed UCR long-term bioassay sample batching modifications considering TOC.